

CHAPTER 4

Direct Cost Development

4.1 General. Direct costs are those costs that can be attributed to a single task of construction work that are applied to the prime contractor's cost. These costs are usually associated with a construction labor crew performing a task, using specific equipment and materials, or subcontracted efforts for the respective task. Subcontracted costs shall be considered as direct costs to the prime contractor in estimates. Subcontracted costs include the direct costs, which the subcontractor would perform, plus the indirect costs the subcontractor would incur such as subcontractor markups.

4.2 Crews. Direct labor cost requirements are broken into tasks of work. Since each task is usually performed by a labor crew including equipment, the crew must be defined, costed, and a production rate established for the task. Crews may vary in size and mix of skills. The number and size of each crew should be based on such considerations as having sufficient workers to perform a task within the construction schedule and the limitation of workspace. Once the crews have been developed, the task labor costs can be determined based on the production rate of the crew and the labor wage rates.

4.3 Labor. Direct labor costs are defined as base wages plus labor cost additives including payroll taxes, fringe benefits, travel, and overtime allowances paid by the contractor for personnel who perform a specific construction task. In addition to the actual workers, there are generally working crew foremen, who receive an hourly wage and are considered part of the direct labor costs. Certain trades may require travel or subsistence, depending upon trade availability and duration.

4.3.1 Wage Rates

4.3.1.1 A wage rate must be developed for each labor craft, which will represent the total hourly cost rate to the construction contractor. This total rate will include the base wage rate plus labor overtime, payroll taxes and insurance, fringe benefits, and travel or subsistence costs as further described in this chapter. The composite wage rate for each craft will be used for development of the estimate. The computation can be prepared similar to forms found in appendix E.

4.3.1.2 Wage rates are generally well defined. The Davis-Bacon Act, PL 74-403, requires a contractor performing construction in the United States for the Government to pay not less than the prevailing rates set by the Department of Labor. Information on prevailing rates can be found at <http://www.wdol.gov/>. A schedule of minimum rates is included in the project specifications and is normally kept on file for

each location by each local office of counsel. The cost engineer should consult with the contracting officer on any questions regarding determination coverage, specific definitions, or concerns. Where labor is in short supply for certain crafts in the area, the work is in a remote area, or it is well known that rates are higher than the set rate scale will be paid, these higher wage rates should be used instead of the minimum wage, since this would be required of the contractor in order to attract labor to the job. The wage rate should be adjusted to include travel time or night differential where these are a customary requirement.

4.3.1.3 For a long duration project, where future wage rates are known and used, care must be taken to avoid duplication by also applying an escalation rate to such costs.

4.3.2 Overtime and Shift Differential. The cost engineer should carefully consider the available working time in the construction schedule for each task accomplishment in a normal time period. The efficiency of both the second and third shifts should be adjusted to recognize that production will not be as high as the day shift for most types of construction operations. A three-shift operation should normally be avoided due to lower labor efficiency and the requirement to include equipment maintenance.

4.3.3 Overtime. Overtime should be included in the labor cost computation when work in excess of regular time is required by the construction schedule or is the custom of labor in the local vicinity. Overtime labor cost is normally calculated as a percentage of the base wage rate. It is usually based on time and one-half, but may be double time depending on the existing labor agreements. Tax and insurance costs are applied to overtime, but fringe benefits and travel and/or subsistence costs are not. Example 4-1 illustrates the overtime percentage calculation for 40 hours regular time, plus 8 hours overtime at time and one-half:

Example 4-1:

48 hours at straight time	= 48.00 hours
8 hours at ½ time	= 4.00 hours paid
Equivalent straight time	= 52.00 hours
(52 hrs paid/48 hrs worked	= 1.0833) -1 x 100%
= 8.33%	

Note: See example estimate sheets in appendix E for method of application.

4.3.3.1 Shift Operations. Many construction projects utilize multiple shift operations. When estimating direct labor costs for multiple shift operations, the cost engineer should estimate the number of hours to be worked (include shift differential work loss) and the number of hours to be paid for each shift based upon the developed construction schedule. Differential shift premiums may need to be added to the hourly rate.

4.3.3.2 Tabulation of Overtime Percentages. A tabulation of overtime percentages for most conditions is shown in table 4-1. The percentage also includes an allowance for the direct work loss of multiple shift or shift differential, where applicable.

Table 4-1. Overtime and Shift Differential

					Percentages for Overtime and Shift Differential		
	Actual Hours Worked		Hours Paid		1.5x Week/Sat 2x Sun	1.5x Week 2x Sat/Sun	Week 2x All Overtime
Shift	Day	Week	Regular	Overtime			
One-shift operation							
5-Day Week	8	40	40	0	0	0	0
	9	45	40	5	5.56	5.56	11.11
	10	50	40	10	10.00	10.00	20.00
	11	55	40	15	13.64	13.64	27.27
	12	60	40	20	16.67	16.67	33.33
6-Day Week	8	48	40	8	8.33	16.67	16.67
	9	54	70	14	12.96	21.30	25.93
	10	60	40	20	16.67	25.00	33.33
	11	66	40	26	19.70	28.03	39.39
	12	72	40	32	22.22	30.56	44.44
7-Day Week	8	56	40	16	21.43	28.57	28.57
	9	63	40	23	25.40	32.54	36.51
	10	70	40	30	28.57	35.71	42.86
	11	77	40	37	31.17	38.31	48.05
	12	84	40	44	33.33	40.68	52.38
Two-Shift Operation (one 8 hours and one 7.5 hours)							
5-Day Week	15.5	77.5	80	0	3.23	3.23	3.23
	18	90	80	12.5	9.72	9.72	16.67
	20	100	80	22.5	13.75	13.75	25.00
	22	110	80	32.5	17.05	17.05	31.82
	24	120	80	42.5	19.79	19.79	37.50
6-Day Week	15.5	93	80	16	11.83	20.43	20.43
	18	108	80	31	17.13	25.69	31.48
	20	120	80	43	20.42	28.96	38.33
	22	132	80	55	23.11	31.63	43.94
	24	144	80	67	25.35	33.85	48.61

					Percentages for Overtime and Shift Differential		
Shift	Actual Hours Worked		Hours Paid Regular	Overtime	1.5x Week/Sat 2x Sun	1.5x Week 2x Sat/Sun	Week 2x All Overtime
	Day	Week					
7-Day Week	15.5	108.5	80	32.0	25.35	32.72	32.72
	18	126	80	49.5	29.76	37.10	42.06
	20	140	80	63.5	32.50	39.82	47.86
	22	154	80	77.5	34.74	42.05	52.60
	24	168	80	91.5	36.61	43.90	56.55
Two-Shift Operation (each 7.5 hours)							
5-Day Week	15	75	80	0	6.67	6.67	6.67
	18	90	80	15	13.89	13.89	22.22
	20	100	80	25	17.50	17.50	30.00
	22	110	80	35	20.45	20.45	36.36
	24	120	80	45	22.92	22.92	41.67
6-Day Week	15	90	80	16	15.56	24.44	24.44
	18	108	80	34	21.30	30.09	37.04
	20	120	80	46	24.17	32.92	43.33
	22	132	80	58	26.52	35.23	48.48
	24	144	80	70	28.47	37.15	52.28
7-Day Week	15	105	80	32	29.52	37.14	37.14
	18	126	80	53	34.13	41.67	47.62
	20	140	80	67	36.43	43.93	52.86
	22	154	80	81	38.31	45.78	57.14
	24	168	80	95	39.88	47.32	60.71
Three-Shift Operation							
5-Day Week	22.5	112.5	120	0	6.67	6.67	6.67
6-Day Week	22.5	135.0	120	24	15.56	24.44	24.44
7-Day Week	22.5	157.5	120	48	29.52	37.14	37.14

4.3.4 Taxes and Insurance

4.3.4.1 Rates. Rates for all taxes and insurance applied to labor should be verified prior to computation. Insurances may include costs applied to longshoreman work near water, diving work, etc. Local unions can be a source of information for these peculiar insurance applications.

4.3.4.2 Workman's Compensation. Workman's compensation and employer's liability insurance costs applicable for the state in which the work is performed should be included in the composite wage rate. Insurance rates may be obtained from the state if the state law provides a monopoly or from insurance companies providing this type insurance. The project compensation rate is based on the classification of the major construction work and applies to all crafts employed by the contractor. Typically, the

actual rate that a contractor will pay is also adjusted annually based upon the company safety record and the number of claims submitted.

4.3.4.3 Unemployment Compensation Taxes. Unemployment compensation taxes are composed of both state and Federal taxes. Unemployment compensation tax will vary with each state while the Federal unemployment tax will be constant for all projects. Insurance rates can be obtained from the state unemployment office, commercial publications, or the Bureau of Labor Statistics.

4.3.4.4 Social Security Tax Rates. The social security tax rates and the income ceilings on which social security taxes must be paid vary from year to year. Therefore, the cost engineer must verify the rate to be used in the cost estimate. Current and future rates can be obtained from the Social Security Administration.

4.3.4.5 Total Percentage of Taxes and Insurance. The total percentage of the above taxes and insurance is summed and then applied to the basic hourly wage rate plus overtime for the various crafts. Example 4-2 illustrates the method for deriving the total tax and insurance percentage. Since rates are subject to change and in some cases vary by region, the calculations shown are presented as an example only. Actual values must be determined by the cost engineer for the specific project.

Example 4-2:

Workman's compensation and employer's liability

(varies with state and contractor) 7.60%

State unemployment compensation

(varies with each state) 3.20%

Federal unemployment compensation 0.80%

Social Security & Medicaid 7.65%

Total taxes and insurance 19.25%

Note: Foreman and overhead labor rates must also include these applicable costs. See example estimate sheets in appendix E for method of application.

4.3.5 Fringe Benefits and Travel/Subsistence

4.3.5.1 Fringe benefits may include health and welfare, pension, and apprentice training depending on the craft and the location of the work. These summed costs are usually expressed as an hourly cost with the possible exception of vacation, which may be easily converted to an hourly cost. The type of fringe and the amount for the various crafts can usually be found with the Davis-Bacon Act wage determination in the specifications. Non-union contractors pay comparable fringe benefits directly to their employees.

4.3.5.2 Example 4-3 illustrates the calculations for fringe benefits. Since the values change and vary by region and union agreement, the calculations shown are presented as an example only. Actual values must be determined by the cost engineer.

Example 4-3

Health and welfare \$0.70/hr

Pension 0.75/hr

Apprentice training 0.00/hr

(N/A in this case)

Total fringe benefits \$1.45/hr

4.3.5.3 Travel and subsistence costs are normally expressed as a daily or weekly cost. When included in the cost estimate, they should be converted to an hourly cost and excluded from an overtime premium unless travel and subsistence are part of an increased hourly wage. See example estimates in appendix E for methodology.

4.3.5.4 Some fringe benefits and travel/subsistence are subject to payroll taxes. For example, vacation benefits are taxable and should be added to the basic wage rate.

4.4 Labor Productivity.

4.4.1 General. Estimating labor productivity is subject to many diverse and unpredictable factors. There is no substitution for the knowledge and experience of the cost engineer when estimating labor productivity. For some types of work, the task productivity of crewmembers such as equipment operators, helpers, or oilers is determined by the productivity of the equipment. For some labor-based crews, the task productivity of craftsman, such as carpenters, steel workers, and masons, may be

based on average experience in the Cost Book, tempered with the experience of the cost engineer, historical records, or other appropriate reference manuals.

4.4.2 Productivity Adjustment Considerations

4.4.2.1 Labor Effort. The labor effort needed to perform a particular task varies with many factors, such as the relative experience, capability and morale of the workers, the size and complexity of the job, the climatic and topographic conditions, the degree of mechanization, the quality of job supervision, amount of similar task repetition, and the existing labor-management agreements and/or trade practices. The effort from these labor efficiency factors and work practices that exist in the project locality must be considered in each productivity assignment.

4.4.2.2 Civil works projects are normally heavy equipment oriented, and care should be used based on the tasks performed to ensure reasonable production rates are used. Operational requirements for pumping on dredges are unique and appropriate details are covered in appendix D for preparing dredge estimates.

4.4.2.3 Complexity of the Variable. The complexity of the variables affecting productivity makes it difficult to estimate a production rate. Therefore, production rates should be based on averaging past production rates for the same or similar work. The cost engineer must incorporate particular job factors and conditions to adjust historical data to the project being estimated. Other sources for production rates include reference manuals, field office reports, construction logbooks, and observation of ongoing construction.

4.4.2.4 Long Periods of Overtime. It is widely accepted that protracted overtime can result in lost productivity. The effect on worker productivity from long periods of overtime is shown in figure 4-1. Several tables and averaging charts have also been developed by private industry to show this effect. There are certain projects where multiple shifts are not possible due to environmental or public concerns. There are also certain large projects where overtime may be an advantage regarding schedule needs and the project appeals to industry for bidding competition. Many skilled trades prefer and seek projects promising overtime as a means of increasing their income. Relating to a specific project, the cost engineer should carefully consider other alternatives such as schedule duration change instead of overtime or multiple shift work and discuss the impact of these options with the PDT.

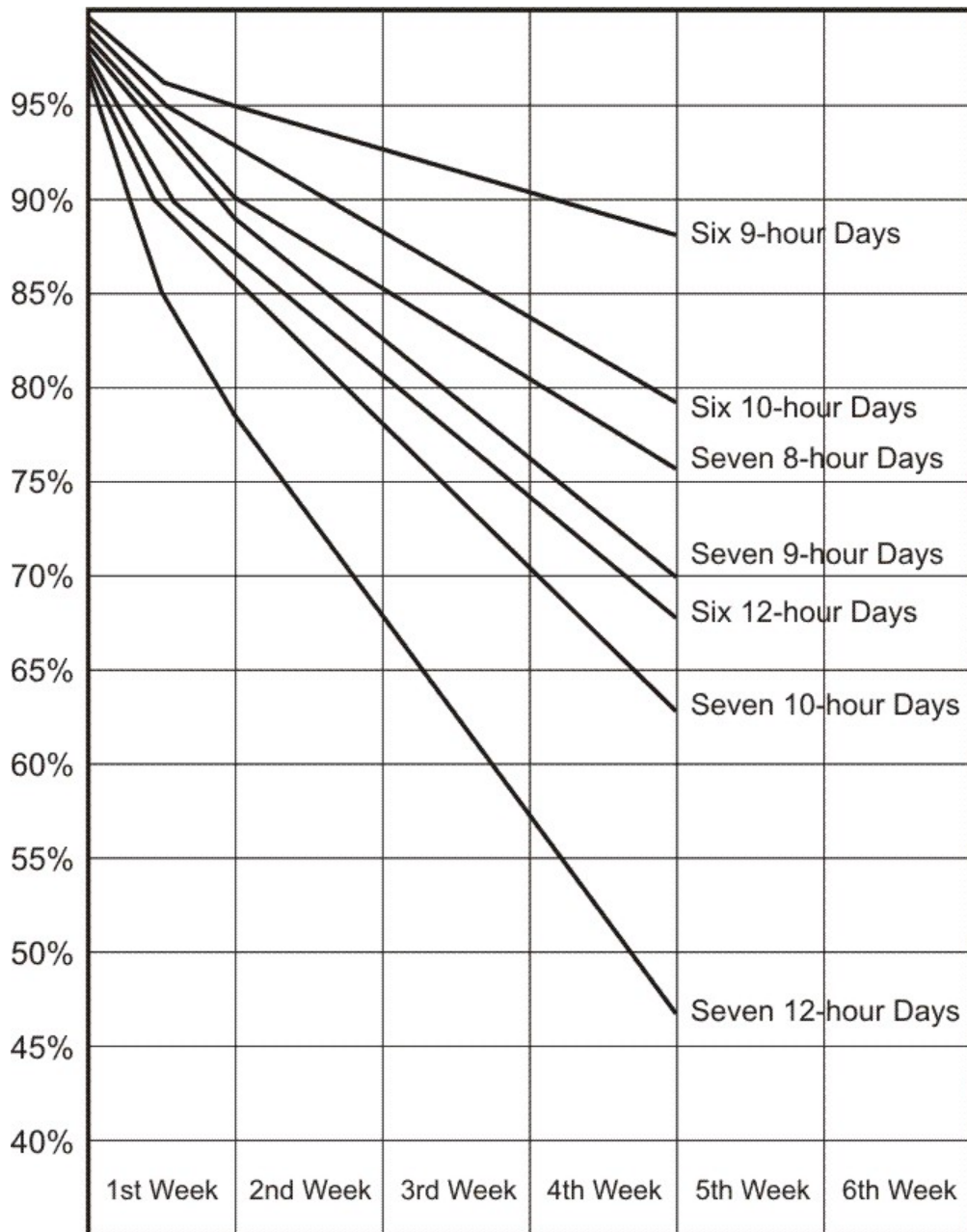


Figure 4-1. Effects on Worker Productivity from Long Periods of Overtime

4.5 Construction Equipment and Plant. Construction equipment and plant refers to the tools, instruments, machinery, and other mechanical implements required in the

performance of construction work. Construction plant is defined as concrete batch plants, aggregate processing plants, conveying systems, and any other processing plants, which are erected in place at the job site and are essentially stationary or fixed in place. Equipment is defined as items, which are portable or mobile, ranging from small hand tools through tractors, cranes, and trucks. For estimating purposes, plant and equipment are grouped together as equipment costs.

4.5.1 Selection of Equipment

4.5.1.1 An important consideration in the preparation of an estimate is the selection of the proper equipment to perform the required tasks. The cost engineer should carefully consider number, size, and function of equipment to arrive at optimum equipment usage. Some factors to consider during the selection process are:

- Conformance to specification requirements.
- Job progress schedule (production rate).
- Magnitude of the job; type of materials.
- Availability of space and site access.
- Mobility and availability of equipment.
- Suitability of equipment for other uses.
- Onsite batch or production plants.
- Equipment capabilities.
- Loading and unloading of freight.
- Number of shifts.
- Distances material must be moved.
- Steepness and direction of grades.
- Weather conditions.
- Hauling restrictions.
- Standby time.
- Mobilization and demobilization costs.

4.5.1.2 The cost engineer preparing the estimate must be familiar with construction equipment and job-site conditions. The equipment selected should conform to contract requirements and be suitable for the materials to be handled and conditions that will exist on the project. A good source of information to assist in earthwork equipment choices is Field Manual 5-434, Earthmoving Operations.

4.5.2 Equipment Productivity

4.5.2.1 The "crew concept" for project cost estimates requiring detailed estimating is to also be considered in costing equipment. For each significant work task, workers and equipment are expressed in the hourly cost and expected

production rate. Where a major piece of equipment serves more than one crew, the total equipment time should be prorated between both crews.

4.5.2.2 After determining the type of equipment to be employed, the cost engineer should select the specific equipment size that has a production rate suited to the efficient and economical performance of the work. The size and number of units required will be influenced by equipment production rate, job size, availability of space for equipment operations, the project construction schedule for the various work tasks, number of shifts to be worked, and the availability of equipment operators. Emphasis must be placed on the importance of establishing a reasonable production rate. Production may be based on actual performance data, commercial manufacturer tables, or rates from MCACES historical equipment models and assemblies, or adjusted for project conditions. A certain level of standby costs may be necessary if the equipment chosen is used on a part-time basis, remaining dormant without operator attendance for a significant period of the operation.

4.5.3 Mobilization and Demobilization

4.5.3.1 Mobilization costs for equipment include the cost of loading at the contractor's yard, transportation cost from the yard to the construction site, including permits, unloading at the site, necessary assembly and testing, and standby costs during mobilization and demobilization. Trucks for the project capable of highway movement are usually driven to the site and are often used to transport minor items. All labor, equipment, and supply costs required to mobilize the equipment should also be included in the mobilization cost. When the equipment location is unknown, the mobilization and demobilization distance should be based on a circular area around the project site, which will include a reasonable number of qualified bidders. Demobilization costs should be based on that portion of the equipment that would be expected to be returned to the contractor's storage yard and may be expressed as a percentage of mobilization costs. All labor, equipment, and supply costs required for cleaning/prepping the equipment so that it is in the same condition as it was when it arrived at the site should also be included in the demobilization cost. Transporting rates should be obtained periodically from qualified firms normally engaged in that type work.

4.5.3.2 Mobilization and demobilization costs for plant should be based on the delivered cost of the item, plus erection, taxes, and dismantling costs minus salvage value at the end of the project. Maintenance and repair are operating costs and should be distributed throughout work accomplishment.

4.5.4 Equipment Ownership and Operating Expense Cost Rates

4.5.4.1 The EP 1110-1-8 establishes the methodology for calculating hourly rates for equipment ownership and operating expense. Similar methodology and hourly rates can be found in the Cost Book and used in the preparation of cost estimates for

owned equipment. The EP 1110-1-8, volumes 1 through 12, has been developed for different geographic regions in the United States, and the appropriate volume or Cost Book should be used based upon project location. Rented and leased equipment is appropriate for inclusion in the estimate at competitive rates if judgment determines this to be a reasonable approach by a prudent contractor. The cost engineer may also use current commercially available publications for assistance in determining rates.

4.5.4.2 When the cost engineer develops costs for the actual equipment being used at a job site exceeding 40 hours per week, the rates shall be adjusted as described by EP 1110-1-8.

4.5.5 Plant Cost. In cases of highly specialized plant, 100 percent write off of the total value of the plant may be justified for a particular project. For less highly specialized plant, some salvage may be anticipated, depending on storage cost, resale value, and probability of sale or reuse in the immediate future. The total project charge including operation, maintenance, and repair should be distributed in proportion to the time and item the plant is used on the various contract items. Cost of plant required for the production of concrete, aggregates, ice or heat for cooling or heating of concrete, etc., should normally be included in the estimate as part of the cost of these materials or supplies manufactured or produced at the site.

4.5.6 Small Tools. The cost of small power and hand tools and miscellaneous non-capitalized equipment and supplies may be estimated as a percentage of the labor cost. The allowance must be determined by the cost engineer in each case, based upon experience for the type of work involved. The small tool cost will be considered as part of equipment cost. Such allowance can range typically up to 12 percent of direct labor cost. Another acceptable approach is to apply an actual small tools cost within the respective crew where it is applicable. The cost engineer must ensure that this cost is not duplicated in the overhead rate percentages. The crew's database in the Cost Book does not contain a small tools allowance.

4.6 Materials and Supplies. Materials and supplies are defined below and, for the purpose of estimating, both can be considered materials unless they need to be separated because of different tax rates. Materials are physically incorporated into and become part of the permanent structure. Supplies are items used in construction but do not become physically incorporated into the project such as concrete forms, welding rod, etc.

4.6.1 Sources of Pricing Data. Prices for materials and supplies may be obtained from pricing services, the Cost Book, commercial cost books, catalogs, quotations, and historical data records. Each office should review the source of the pricing contained in these publications and assess the reasonableness prior to use. Standard unit prices from these sources are considered satisfactory only after an

applicability determination has been made. Care should be taken when using this type of cost data to make proper allowances for quantity discounts, inflation, and other factors affecting contractor cost.

4.6.2 Waste Allowance. Waste and loss considerations may be included in material unit price computations. This methodology when computing material costs results in a quantity takeoff of work placement, which is not altered to reflect material losses. However, the alternative methodology of increasing the measured quantity by waste and loss quantity is acceptable if the excess quantity will not be used for any other purpose. If quantities are provided by others, it must be determined whether those quantities include waste or loss to avoid a double counting. The methodology used by the cost engineer should not include charging labor on the excess quantity. In either case, a note statement is required in the estimate explaining the methodology used.

4.6.3 Quotes from Manufacturers and Suppliers. Quotes should be obtained for all significant materials and installed equipment and for specialized or not readily available items. Quotations may be received either in writing or telephonically. It is preferable to obtain quotes for each project to ensure that the cost is current and that the item meets specifications. If possible, more than one quote should be obtained to be reasonably sure the prices are competitive. The cost engineer should attempt to determine and ensure that contractor discounts are considered in the estimate. The cost engineer should ascertain whether the quote includes delivery and sales tax. Quotes should be kept proprietary to preserve the confidentiality entrusted. A sample telephone quotation data sheet similar to that shown in appendix E, figure E-5, should be utilized for recording quoted information. The cost engineer should also take into consideration FAR Subpart 25.2, *Buy American Act-Construction Materials*, and FAR Subpart 6.1, *Full and Open Competition*, for the materials specified.

4.6.3.1 Forward Pricing. Sometimes quotes are requested in advance of the expected purchase date. However, suppliers are reluctant to guarantee future prices and often will only quote current prices. It may, therefore, be necessary to adjust current prices to reflect the cost expected at the actual purchase date. This cost adjustment, if required, must not be included as a contingency but should be clearly and separately defined in each estimate. Adjust current pricing to future pricing using escalation factors. This is applicable when there will be an extended construction period. Computations of adjustment should be clear and should be maintained as cost estimate backup support.

4.6.3.2 Freight. The cost engineer should check the basis for the price quotes to determine if they include delivery. If they do not include delivery, freight costs to the project site must be determined and included. The supplier can usually furnish an

approximate delivery cost. For delivery charge, Free on Board (FOB) refers to the point to which the seller will deliver goods without additional charge to the buyer.

- FOB Factory or Warehouse - if the materials or supplies are FOB factory or warehouse, freight costs to the construction site should be added to the cost of the materials or supplies.
- Unloading and Transporting Materials or Supplies - if the cost of materials or supplies includes partial delivery, FOB to the nearest rail station, the cost of unloading and transporting the materials or supplies should be included in the estimate.

4.6.4 Handling and Storage

4.6.4.1 If the materials or supplies are a large quantity in bulk that would require extensive equipment for unloading and hauling, it may be desirable to prepare a labor and equipment estimate for the material handling and delivery.

4.6.4.2 The contractor is usually required to offload, handle, and stockpile or warehouse materials on site. These costs should be included in the estimate. An item of electronic equipment requiring special low-humidity storage might have this special cost added to the direct cost of the equipment. For common items, such as construction materials or equipment needing secure storage, the cost for the security fencing, temporary building, and material handling should be considered as an indirect cost and be included in the job site overhead cost.

4.6.5 Taxes. When applicable, state and local sales tax should be added to the materials or supplies cost. In some states, material incorporated into Federal construction is exempt, but supplies are not. Care should be taken, therefore, that the sales tax rate is applied as required. The cost engineer should verify the tax rates and the applicability of these rates for the project location. Sales tax is considered a direct cost of the materials and supplies and should be applied to Government-furnished equipment and included in the estimate. In certain projects that are on the dividing line between states, such as roads, bridges, and dams, tax application may vary for the same material.

4.6.6 Materials or Supplies Manufactured or Produced at Site. If it is likely the contractor will manufacture or produce materials or supplies at the project site, a separate estimate component should be developed for this work. This estimate should be detailed and include all equipment, labor, materials, and supplies to produce the product and should conclude with a unit cost of material or supplies delivered to the stockpile, storage yard, or other end point.

4.6.7 Government-Furnished Materials or Equipment. On some projects, the Government may provide some of the project materials. Government-furnished

materials and equipment should be estimated in the same manner as other materials, except that the purchase price is not included. The estimate should include an allowance for transporting handling, storage from point of delivery and assembly, sales tax, and installation if applicable. There may be special costs associated with Government-furnished materials such as insurance to cover loss until final installation, special storage costs, or special security measures. Note that these materials and procurement costs are normally to be included as part of the TPC.

4.7 Subcontracted Work.

4.7.1 In construction, specialty items such as plumbing, heating, electrical, roofing, and architectural finishes are usually more effectively performed by subcontract. With so many specialties being performed, subcontract work becomes a very significant portion of the total costs of construction. Since each estimate should be prepared as practically and as realistically as possible, subcontract costs become a necessary consideration.

4.7.2 On major rehabilitation projects, such as dams, locks, or power generating facilities, the cost engineer must ensure that costs for mobilization and demobilization, access to site, tear down or demolition work, and contractor markup are included with the subcontractor costs or added to the prime contractor. This is particularly important for rebuilt or replacement of permanent equipment (e.g., turbines, generators, and navigation lock gates) for previously constructed projects where ancillary costs, in addition to the rebuilt costs, can be significant (e.g., exceed \$1 million).

4.7.2.1 Parts of Work to be Subcontracted. The cost engineer must first determine those parts of the work that will probably be subcontracted. When the work to be subcontracted has been determined, those items will be identified in the estimate. The appropriate subcontractor overhead and profit costs should be applied to subcontractor direct cost items in addition to the appropriate prime contractor overhead and profit.

4.7.2.2 Cost of Subcontracted Work. The cost of subcontracted work is the total cost to the prime contractor for the work performed. Subcontractor's costs include direct labor, materials and supplies, equipment, second tier subcontracts, mobilization and demobilization, transportation, setup, and charges for overhead and profit. Particular attention should be given to large items such as turbines, generators, and incinerators. The total subcontract cost is considered a direct cost to the prime contractor.

4.7.2.3 Use of Quotations. While not the preferred method, the cost engineer may utilize quotes for the expected subcontracted work when reviewed and verified as reasonable. This is more acceptable if the subcontracted work is not considered a major task in the estimate and not intended for use as an IGE where the IGE

independence may be compromised. Verification is normally established by obtaining several quotes or by developing a rough order estimate or by making comparison with historical or parametric data. In lieu of a quotation, each task of the subcontract should be priced as a direct cost with an appropriate rate of subcontractor's overhead and profit added.